




# Inclined Plane Flowing Mercury Cathode Electrolysis Cells

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**Inventor:**  
**Applicant:** ORONZIO DE NORA IMPIANTI (IT)  
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C25B9/14; C25B1/00; C25B9/00;  
C25B9/12; (IPC1-7): C01D  
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C25B9/14B2  
**Application number:** GB19680010415 19680304  
**Priority number(s):** US19670621399 19670303

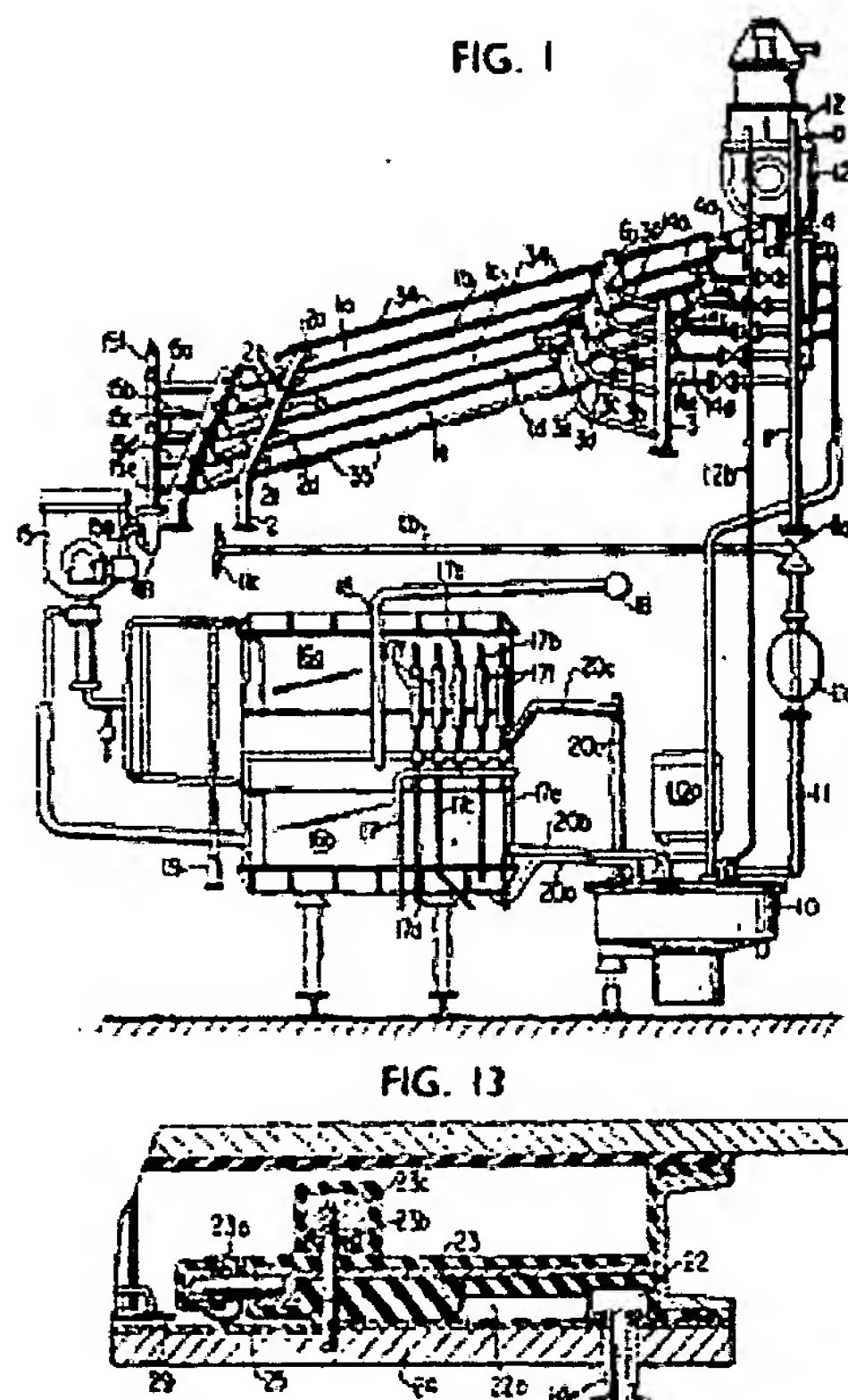
**Also published as:**

 NL6802168 (A)  
 FR1566457 (A)  
 BE711576 (A)

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## Abstract of GB1179662

1,179,662. Mercury cathode electrolysis cells. ORONZIO DE NORA IMPIANTI ELETTOCHIMICI S.A.S. March 4, 1968 [March 3, 1967], No.10415/68. Heading C7B. In a flowing mercury electrolysis cell comprising a cathode base plate over which mercury can flow, anodes terminating above and adjacent the base plate, means to introduce into and withdraw electrolyte from the cell while maintaining the cell substantially filled with electrolyte, and means to introduce mercury into and discharge amalgam from the cell, and insulating mercury spreader member extends across the cell above the base-plate adjacent the mercury inlet, the member being so shaped and located that mercury introduced into the cell through the inlet is separated from the electrolyte by the member for a distance approximately equal to one sixth of the length of the base plate in a longitudinal direction. In the form shown in Fig. 1 a tier of 5 cells 1a, b, c, d and e superposed one above the other and connected to a source of current via anode bus bars 34 and cathode bus bars 35, the bases of the cells intermediate thereof forming bipolar electrodes. Mercury is supplied to the cells by means of pump 10 driven by motor 10a via conduit 11,



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electromagnetic flow meter 11d, a mercury feed proportionator 12 where it is separated into five equal streams each of which is passed to a mercury feed star wheel circuit breaker 12a. (Figs. 6-8, not shown) and thereafter via the inlets 14a, .. e to the cells 1a ... e. Amalgam leaves the cell via conduits 15a ... .. e, the streams of amalgam passing via amalgam discharge star wheel circuit to separate decomposers 16a ... e from whence the mercury recovered is recirculated. Electrolyte is supplied to the cells via inlets 4a .., e (4a only shown) and is discharged via outlets 2a .., e. Above the mercury inlet of each cell is positioned the mercury spreader member 23 (see Fig.13), and the electrolyte inlets 4a being positioned above this member (not shown in Fig. 13). The anodes may comprise perforated platinum plated titanium sheets connected by conductor rods to the under surface of the cathode base plate of the tier above. (Fig. 4 not shown).

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# PATENT SPECIFICATION

DRAWINGS ATTACHED

L179,662



L179,662

Date of Application and filing Complete Specification: 4 March, 1968.

No. 10415/68.

Application made in United States of America (No. 621399) on 3 March, 1967.

Complete Specification Published: 28 Jan., 1970.

Index at acceptance: —C7 B(A1C, A2A2, A2A4, A2B1, A2C2)

International Classification: —C 22 d 1/04

## COMPLETE SPECIFICATION

### Inclined Plane Flowing Mercury Cathode Electrolysis Cells

- We, ORONZIO DE NORA IMPIANTI ELET-  
TROCHIMICI S.A.S., an Italian Corporation,  
of Via Bistolfi 35, Milan, Italy, do hereby  
declare the invention, for which we pray that  
a patent may be granted to us, and the  
method by which it is to be performed, to be  
particularly described in and by the follow-  
ing statement:—
- This invention relates to inclined plane  
flowing mercury cathode electrolysis cells  
whether in the form of single cells or of in-  
stallations comprising several cells arranged  
in tiers. In either case such cells are operated  
at an inclination to the horizontal of between  
about 2° and about 85° from the horizontal,  
the preferred inclination being between about  
5° and 30°.
- According to the present invention a cell  
of this kind, that is comprising an inclined  
cathode base plate over which mercury can  
flow, anodes terminating above and adjacent  
the base plate, means to introduce into and  
withdraw electrolyte from the cell while main-  
taining the cell substantially filled with elec-  
trolyte, an outlet for discharging amalgam  
from the cell, and an inlet for introducing  
mercury into the cell, includes an insulating  
mercury spreader member extending across  
the cell above the base plate and above the  
mercury inlet, the member being so shaped  
and located that mercury introduced into  
the cell through the inlet is separated from  
the electrolyte by the member for a distance  
approximately equal to one sixth of the  
length of the base plate in a longitudinal  
direction. The provision of such a spreader  
member is found to give improved operation  
since it prevents contact between the mercury  
and gas at the upper end of the cell.
- By way of example constructions in accord-  
ance with the invention will now be described  
with reference to the accompanying draw-  
ings in which:—
- Figure 1 is a side elevation of an installa-  
tion for the production of chlorine and caustic  
soda by electrolysis of brine;
- Figure 2 is a plan view of the installation  
with parts broken away;
- Figure 3 is a part sectional plan view of  
the bottom tier of cells in the installation  
taken essentially along the line 3—3 of  
Figure 4;
- Figure 4 is a side view of the five tiers  
of cells showing the bottom tier in section,  
taken substantially along the line 4—4 of  
Figure 3;
- Figure 5 is a sectional view taken along the  
line 5—5 of Figure 3;
- Figure 6 is a part sectional view of the  
proportionating mercury feeder and star wheel  
circuit breaker in the installation;
- Figure 7 is a part sectional plan view taken  
along the line 7—7 of Figure 6;
- Figure 8 is a sectional view taken along  
the line 8—8 of Figure 6;
- Figure 9 is a detailed view of one of the  
end boxes in the installation;
- Figure 10 is an enlarged section of the  
hold down bars in the installation for the  
nickel plates on the cathode base plate;
- Figure 11 is a detailed sectional view of a  
side wall of one tier;
- Figure 12 is a detailed sectional view of  
the feed end of two tiers;
- Figure 13 is a detailed sectional view of a  
mercury spreader in the installation;
- Figures 14 and 14A are sectional views of  
modified forms of mercury spreader which  
may be used; and
- Figure 15 is a sectional view of one form  
of water mercury separator which may be  
used.
- Referring to Figure 1, the installation illus-  
trated comprises five tiers of electrolysis cells  
1a, 1b, 1c, 1d and 1e stacked one on top of  
the other and inclined at about 15° from the  
horizontal. Electrical current flows from the  
top tier through the entire stack to the bottom

[Price 5s. 0d.]

# Inclined Plane Flowing Mercury Cathode Electrolysis Cells

Description of GB1179662

## PATENT SPECIFICATION

DRAWINGS ATTACHED 1, 1793662 a!, \ - Date of Application and filing Complete Specification: 4 March, 1968.

v No. 10415168.

Application made in UnitedStates of America (No. 621399) on 3March, 1967.

>: , / Complete Specification Published: 28 Jan., 1970.

Index at acceptance: 7 B(A1C, A2A2, A2A4, A2B1, A2C2) International Classification: -- C 22 d 1/04 COMPLETE SPECIFICATION

Inclined Plane Flowing Mercury Cathode Electrolysis Cells We, ORONZIO DE NoRA IMPIANTI ELETTROCHIMICI S.A.S., an Italian Corporation, of Via Bistolfi 35, Milan, Italy, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: -

This invention relates to inclined plane flowing mercury cathode electrolysis cells whether in the form of single cells or of installations comprising several cells arranged in tiers. In either case such cells are operated at an inclination to the horizontal of between about 20 and about 850 from the horizontal, the preferred inclination being between about and 300.

According to the present invention a cell of this kind, that is comprising an inclined cathode base plate over which mercury can flow, anodes terminating above and adjacent the base plate, means to introduce- into and withdraw electrolyte from the cell while maintaining the cell substantially filled with electrolyte, an outlet for discharging amalgam from the cell, and an inlet for introducing mercury into the cell, includes an insulating mercury spreader member extending across the cell above the base plate and above the mercury inlet, the member being so shaped and located that mercury introduced into the cell through the inlet is separated from the electrolyte by the member for a distance approximately equal to one sixth of the length of the base plate in a longitudinal direction. The provision of such a spreader member is found to give improved operation since it prevents contact between the mercury and gas at the upper end of the cell.

By way of example constructions in accordance with the invention will now be described with reference to the accompanying drawings in which: Figure 1 is a side elevation of an installa[Pricc Ss. Od.] tion for the production of chlorine and caustic soda by electrolysis of brine; Figure 2 is a plan view of the installation with parts broken away; Figure 3 is a part sectional plan view of the bottom tier of cells in the installation taken essentially along the line 3-3 of Figure 4; Figure 4 is a side view of the five tiers of cells showing the bottom tier in section, taken substantially along the line 4-4 of Figure 3;

Figure 5 is a sectional view taken along the line 5-5 of Figure 3; Figure 6 is a part sectional view of the proportionating mercury feeder and star wheel circuit breaker in the installation; Figure 7 is a part sectional plan view taken along the line 7-7 of Figure 6;



Figure 8 is a sectional view taken along the line 8-8 of Figure 6; Figure 9 is a detailed view of one of the end boxes in the installation; Figure 10 is an enlarged section of the hold down bars in the installation for the nickel plates on the cathode base plate; Figure 11 is a detailed sectional view of a side wall of one tier; Figure 12 is a detailed sectional view of the feed end of two tiers; Figure 13 is a detailed sectional view of a mercury spreader in the installation; Figures 14 and 14A are sectional views of modified forms of mercury spreader which may be used; and Figure 15 is a sectional view of one form of water mercury separator which may be used.

Referring to Figure 1, the installation illustrated comprises five tiers of electrolysis cells 1a, 1b, 1c, 1d and 1e stacked one on top of the other and inclined at about 15° from the horizontal. Electrical current flows from the top tier through the entire stack to the bottom tier, making the installation operate as a bipolar electrode cell. The tiers are essential rectangular box-like structures, as illustrated in Figure 3, having side walls which instead of being parallel, converge toward each other, from the top end to the bottom end of each tier. This convergence is about 1/2 inch for every 6 feet of cell length. Convergence in the side walls ensures better mercury coverage at the side edges of the cells as the mercury flows from the inlet to the outlet of each tier. The tiers are stacked in an offset manner in stair tread pattern as illustrated in Figures 2 and 4. Alternatively they may be offset transversely instead of longitudinally.

Concentrated brine from headers 2, one of which is located on each side of the installation, flows through conduits 2a, 2b, 2c, 2d and 2e into the individual tiers and the depleted brine flows from the tiers through conduits 3a, 3b, 3c, 3d and 3e to headers 3, one of which is located on each side of the installation.

Brine level regulators located within the enlarged parts 6 of the conduits 3a-3e permit regulation of the level of the brine in each tier so that each may be kept substantially filled or "flooded" with electrolyte to its upper edge as indicated by the brine level lines A in Figure 4.

When the brine, i.e. sodium chloride, is electrolyzed, the electrolysis gas, chlorine, flows through gas outlets 4a, 4b, 4c, 4d and 4e, one of which is located at each side of the upper end of each tier, into a chlorine gas header 4 and then to a chlorine recovery system. Only one gas outlet 4a is illustrated in Figure 1, but pairs of gas outlets are provided for each tier as illustrated in Figures 3 and 4. While it is preferable to feed substantially saturated brine into the lower end of each tier and remove the depleted brine near the top of each tier, as in the illustrated installation, the brine can be fed into and removed from either end of the tiers or at any place along their length.

Mercury is fed to the tiers 1a, 1b, 1c, 1d and 1e by means of a pump 10, driven by a motor 11a, through a main mercury circuit conduit 11 to a mercury feed proportionator 12 where it is separated (Figures 6 to 8) into five separate but equal streams and passes through conduits 13a, 13b, 13c, 13d and 13e (Figure 6) to a mercury feed star wheel circuit breaker 12a and then through conduits 14a, 14b, 14c, 14d and 14e into the tiers of cells. Water separators and traps (not shown) are provided in the conduits 14a, 14b, 14c, 14d and 14e to ensure separation of water and solids from the mercury streams before they enter the tiers. Mercury flowing to the proportionator 12 in excess of the amount required is returned to the pump 10 by way of a conduit 12b. A control valve 11b controlled through a rod 11c by a fly handle 11d is used by the operator to control the mercury flow through the conduit 11. An inductive electromagnetic flow meter 11e is located in the conduit 11 to measure the mercury flow. The function of the proportionator 12 and the circuit breaker 12a will be described more fully subsequently.

The mercury flows by gravity through the Y cells wherein the brine is electrolyzed to

produce chlorine and the mercury picks up a sodium becoming a sodium-mercury amalgam. The amalgam is discharged at the lower end of each of the tiers through conduits 15a, 15b, 15c, 15d and 15e (Figure 2) into an amalgam discharge star wheel circuit breaker 15 where the amalgam from the five separate tiers is separated into individually - separate increments which are fed into separate decomposers.

Alternatively the increments may be combined into a single stream which - passes to a single decomposer operating on all the streams from all of the tiers. As illustrated in Figure 1, five separate decomposers are used but only two decomposers 16a and 16b are visible, the other three decomposers being located behind the decomposers 16a and 16b. All the decomposers are located under the tiers thereby conserving floor space. In the decomposers, water flowing from an inlet 17 flows through conduits 17a, 17b, 17c, 17d. and 17e and through the decomposers where it is contacted -with the amalgam to produce hydrogen, which is discharged through a header 18 and sodium hydroxide, which flows through a conduit 19 to a recovery system, and the mercury substantially freed from sodium is recycled through conduits 20a, 20b, 20c and not visible conduits 20d and 20e back to the pump 10. A rotameter 17f in each of the water feed conduits shows the flow of water in each conduit.

In the pump 10 all of the mercury is at earth potential and the individual streams fed into the tiers and discharged as amalgam from each tier must pass through the circuit breakers 12a and 15 at the inlet and outlet ends of the tiers so that the mercury and amalgam circuits are broken at these points, as each tier operates at a different voltage.

Wash water for flushing the cells, for washing the mercury in the proportionator 12, in the circuit breakers 12a and 15, and in the pump 10, and for flushing endboxes 33a-33e. (Figure 4) is provided where needed. Many of the water inlet and outlet conduits are not shown to prevent over-complicating the drawings.

The mercury enters the tiers 1a, 1b, 1c, 1d and 1e from the conduits 14a, 14b, 14c, 14d and 14e through the base of the tiers as illustrated in Figures 4, 12 and 13, and flows into a cross-channel 22 formed in a lucite or other insulating header bar 23 which extends from one side to the other side across the tier. The five header bars 23 of the five tiers extend about one sixth of the length of the baseplates downwards, that is longitudinally, along the cathode base plates 24 of each tier and terminate in series of comb tooth lips 23a (Figure 13) which perform the function of spreading the mercury uniformly over the cathode base plate of each tier and of bringing it into contact with the electrolyte well below the electrolyte level A indicated in Figure 4. As a result the incoming mercury does not contact the chlorine in the gas space above the level A.

The header bars 23 (Figure 13) have passages 22a extending from the cross-channels 22 which discharge the mercury on to the cathode base plates above the comb tooth lips 23a and above the first anode plates 29.

Bolts 23b extending between the cathode base plates 24 and insulated nuts 23c hold the lower end of the header bars 23 firmly against the base plates 24 and ensure uniform distribution of the mercury over the base plates and the maintenance of a uniform passage at the discharge end of the header bars so as to provide a uniform flow of mercury on to the base plates and down the cathode surface of each tier.

Figures 14 and 14A illustrate alternative forms of mercury spreaders. In Figure 14 a steel plate 23d terminating in a steel bar 23e and encased in lucite or rubber insulation separates the mercury from the electrolyte and a nickel bar 23f provides a dam behind which a reservoir of mercury forms flowing over the dam and under the forward edge of the spreader to provide uniform spreading of the mercury over the base plate 25. Figure



14A shows a lucite insert 23g installed between the dam 23f and the forward edge of the spreader to protect the outlet from erosion by the mercury flow.

The cathode base plates 24 are of machined steel approximately 3/4 inch thick and an approximately 1/8 inch sheet 25 of nickel is put on the top of each sheet 24 to provide a better surface for the flow of the mercury.

The contact between the nickel sheets 25 and the plates 24 should be as good as possible for good electrical conductivity between these plates. An electrically conductive adhesive may be used between these plates.

The nickel plates 25 are held in contact with the base plates 24 by the side walls 26 (Figure 11) and bolts 27 which secure the side walls to the base plates.

Centre hold-down bars 28 (Figures 5 and 10) extending longitudinally along each tier are held down by belts 28a to maintain the nickel plates 25 in contact with the centre of the cathode base plates 24. This also permits nickel sheets which are only one-half the width of each cell to be used, as the joint between the two nickel sheets is below each hold-down bar 28. The bars 28 have holes (not shown) running through them through which electrolyte can flow. When the surface of the nickel plates has become roughened and pitted due to the action of 70 the flowing mercury and brine, the tiers can be disassembled and the nickel plates turned over to present a new smooth surface for mercury flow. Nickel clad steel plates can, however, be used as cathode plates in place 75 of the separate nickel plates. Nickel base plates corrode less than steel base plates and much less of the so-called "mercury butter" is formed in the cells when nickel base plates are used. 80 The anodes consist of perforated platinum plated titanium sheets 29 (Figures 3, 4, 5 and 9) supported by conductor rods 30 screwed or otherwise electrically connected into the cathode base plate 24 of the tier above. The 85 anodes are spaced a short distance above the cathode base plate of the tier in which they are suspended so that a gap is formed between them and the flowing mercury cathode.

The exposed sides of the rods 30, the side 90 and end walls of the tiers and the bottom of the cathode base plates 24 exposed to the electrolyte are covered with an insulating layer 26a. All other parts of the tiers not intended to act as conductors are likewise protected 95 by insulation against current leakage and corrosion by the electrolyte and chlorine.

As the tiers are operated substantially filled or flooded with electrolyte, the chlorine gas bubbles released at the surfaces of the 100 perforated anode sheets 29 flow vertically upward through the electrolyte and diagonally upward along the top of each tier as indicated by the bubbles and arrows in Figure 4 to cause violent agitation and circulation of 105 the electrolyte. This maintains the temperature and the composition of the electrolyte substantially constant from end to end of the tiers.

Due to the 150 inclination of the base 110 plates, the mercury, or amalgam as it then is, accumulates considerable momentum which it is desirable to absorb within the tiers while avoiding splashing of the mercury into droplets which would be attacked by the chlorine 115 in the electrolyte. To partially absorb this kinetic energy and cause swirling of the amalgam in parts 31a-e of the end boxes 33a-e, the lower end of the cathode base plates 24 are provided with a series of V 120 shaped constricted openings 24a (Figure 3) which constrict the flow of the amalgam and cause it to form swirling pools as is indicated schematically in the three lowermost openings. Lucite windows 32 (Figure 9) are 125 provided for observation of each of these pools. This enables the operator to observe the flow of amalgam into the end boxes.

The amalgam flows from the bottom of the openings 24a through passages 24b and 130

1,179,662 channels 24c as indicated by the arrows 24c (Figure 9) into the end box 33d and then through the conduit 15d to the amalgam circuit breaker 15. In the openings 24a, the amalgam is still in contact with the electro.

lyte above it and at the same time is under cathodic protection because of the negative charge on the plates 24 and 25. The violent agitation of the electrolyte tends to dissolve or mechanically carry out the tiers any impurities which float on top of the swirling amalgam pools in the openings 24a. If these impurities, however, appear to the operator to be excessive, use is made of three flush valves 33f, 33g and 33h (Figure 2) provided in each of the end boxes 33a-33e. By turning the handles of the valves 33f, 33g or 33h, a valve plug 34 (Figure 9) is swung around a pivot 34b to remove it from the opening 34a and permit amalgam and electrolyte to flush through the passage 24b, the opening 34a, and into the end box 33d to clear impurities from the amalgam in the discharge end of the tiers. By providing three such valves in each end box, it is possible to flush one part of a tier while another part is operating and the loss of electrolyte is reduced. In the end boxes, the electrolyte separates immediately from the amalgam by gravity, and water flush conduits 33i are provided to flush the surface of the amalgam in the end boxes with water and to discharge the wash water through a wash water outlet manifold.

From the conduits 15a, 15b, 15c, 15d and 15e, which are at different heights, the amalgam flows through vertical passages 15f, 15g, 15h, 15i and 15j (Figure 2) into amalgam collector boxes 48 (Figure 1) at the level of the circuit breaker 15 and then through passages 15k, 15l, 15m, 15n and 15o into five star wheel compartments in the circuit breaker. This is similar to and operates on the same principle as the star wheel circuit breaker 12a to be described in connection with Figure 6. Spiral flights in the passages 15f, 15g, 15h, 15i and 15j break the fall of the amalgam and prevent splashing. The collector boxes 48 are kept filled with wash water on the top of the amalgam pool in each and means are provided to periodically flush wash water over the surface of the amalgam to clean it.

Anode bus bars 34 are attached to the top of the tier 1a and cathode bus bars 35 are attached to the bottom of the tier 1e. As already explained the installation operates as a bipolar electrode cell and the current passes from the anode bus bars through each tier to the cathode bus bars. Each tier operates at a different voltage because of the voltage drop through the preceding tier but only one set of positive and negative bus bars are needed for each installation.

As previously indicated, since the bipolar tiers operate at different electric potentials, it is necessary to insulate the mercury feed stream to and from each tier to prevent short circuiting and arcing between mercury streams of different potentials. It is also desirable to provide substantially the same amount of mercury feed to each tier so that the tiers operate with substantial uniformity. This is carried out by the mercury proportionator 12 - which comprises a vertically disposed rubber lined cylindrical tank 56 shown in Figures 7 and 8. The mercury conduit 11 from the pump 10 passes upwardly through the tank 56 along its vertical axis and terminates in a pair of inverted tubes 37 and 37a. The tank 56 is closed by a top 36a. For feeding the five tiers, five separate compartments 38a, 38b, 38c, 38d and 38e, are formed in the tank 56 by vertical partitions 39. The five compartments are rubber lined and discharge at 85 their lower end into the conduits 13a, 13b, 13c, 13d and 13e leading to five separate star wheels in the circuit breaker 12a. A vertical shaft 40 journaled in the top 36a is secured to the tubes 37 and 37a at its lower 90° end and is rotated by a power source (not shown) at its upper end.

In operation, mercury delivered to the pump 10 through the conduit 11 passes out of the tubes 37 and 37a as a steady unbroken stream. The tubes are connected to the conduit 11 by a packed joint 41. As the tubes 37 and 37a are rotated by the shaft 40, the mercury stream passes in turn over the compartments 38a, 38b, 38c, 38d and 38e



repeatedly and an equal volume is delivered into each. The mercury which enters the compartments flows by gravity through the conduits 13a, 13b, 13c, 13d and 13e (Figure 6) and through the star wheel circuit breaker 105 12a and then to the tiers through the conduits 14a, 14b, 14c, 14d and 14e. Windows 41a in the top of the circuit breaker permit it to be observed when in operation. As the compartments 38a, 38b, 38c, 38d and 38e 110 are of equal size, substantially equal measured amounts of mercury are fed into each tier.

This assures an equal amount of mercury flowing to and through each of the tiers.

Thus by means of the proportionator 12, the 115 mercury feed stream is divided into substantially equal amounts for each tier and fed through the circuit breaker 12a to the separate tiers.

From the proportionator 12, the mercury 120 for each tier flows through the star wheel circuit breaker 12a, which divides the mercury streams into a number of individually separate increments so that the circuit between each increment is broken. The tiers, 125 operating at different voltages, are thus each fed with an electrically separate mercury stream and short circuiting back to the proportionator 12 or between the streams is prevented. A separate star wheel 42a-e is provided for each tier. The star wheels are mounted on a common horizontal shaft 42 (Figure 6) driven by a motor 45a (Figure 2).

Alternatively they may be permitted to rotate like water wheels by the weight of the mercury falling by gravity on their blades.

Each of the conduits 13a, 13b, 13c, 13d and 13e terminates in a angled discharge pipe 43 having an angled discharge passage 43a.

The angle of the discharge passages in relation to the shaft 42 is about 110. This results in the mercury or amalgam being distributed more uniformly in time into the pools 44 in the eight compartments in each star wheel. The compartments are insulated from one another and the star wheels are insulated from each other along the shaft 42 by insulating vertical partitions 45, the lower portions of which separate the pools of mercury or amalgam from each star wheel from each other.

As illustrated in Figure 8, while the pool 44 is being filled from a pipe 43, the pool 44a has rotated to the point where it is ready to discharge into the pool 44b in the bottom of that particular star wheel compartment. From the pool 44b, the mercury is discharged into the conduits 14a to 14e for feeding the tiers, or in the amalgam circuit breaker 15, into the conduits leading to the individual decomposers 16a, 16b, 16c, 16d and 16e.

Figure 15 illustrates, on an enlarged scale, one form of water mercury separator which may be used in each of the mercury feed conduits 14a, 14b, 14c, 14d and 14e. The water mercury mixture from the circuit breaker 12a, flowing through the conduits 14a-14e, flows into a box 14f having a baffle 14g to break the mercury fall and on to a bottom plate 14h.

Air can escape from the box 14f through a number of holes 14i to the atmosphere. The mercury flows through traps 14j under a number of dams 14k and out into the conduits 14a, 14b, 14c, 14d and 14e leading to the tiers. Water separating from the mercury flows from an opening 14m. Drainage openings may be provided in the bottom of the traps 14j to drain the mercury from the boxes 14f during periods of idleness.

As illustrated in Figures 4 and 12, angle iron sections 46 are secured to the bottom of the cathode base plates 24 for the top four tiers where one tier extends beyond the

other.

These angle irons rest against the electrically insulated flange of the end wall of the next lower tier and prevent the tiers from slipping relatively to one another during assembly.

Various wash water and flushing circuits, shut down circuits and associated valves, 60 mercury fill up starting circuits, heat exchangers, and so forth normally provided for cells of the same general type described have been omitted for clarity.

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# **Inclined Plane Flowing Mercury Cathode Electrolysis Cells**

Claims of GB1179662

WHAT WE CLAIM IS: - 65

1. An inclined plane flowing mercury cathode electrolysis cell comprising an inclined cathode base plate over which mercury can flow, anodes terminating above and adjacent the base plate, means to introduce into and 70 withdrawn electrolyte from the cell while maintaining the cell substantially filled with electrolyte, an outlet for discharging amalgam from the cell, an inlet for introducing mer-

cury into the upper end of the cell, and an 75 insulating mercury spreader member extending across the cell above the base plate and above the mercury inlet, the member being so shaped and located that mercury introduced into the cell through the inlet is separated from the electrolyte by the member for a distance approximately equal to one sixth of the length of the base plate in a longitudinal direction.

2. A cell according to claim 1 in which the 85 base plate is provided with a nickel surface over which the mercury flows.

3. A cell according to claim 1 in which the base plate is provided with a separate reversible nickel sheet over which the mercury flows.

4. A cell according to any one of the preceding claims including an end box extending the width of the cell for receipt of the amalgam produced in the cell and having at 95 least two flush valves in it.

5. A cell according to any one of the preceding claims in which the spreader member is constructed and arranged substantially as described with reference to and as illustrated 100 in any one of Figures 13, 14 and 14A of the accompanying drawings.

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117862 COMPLETE SPECIFICATION  
The Drawing is a representation of  
7 SHEETS  
No. 10,000,000  
Sheet 1

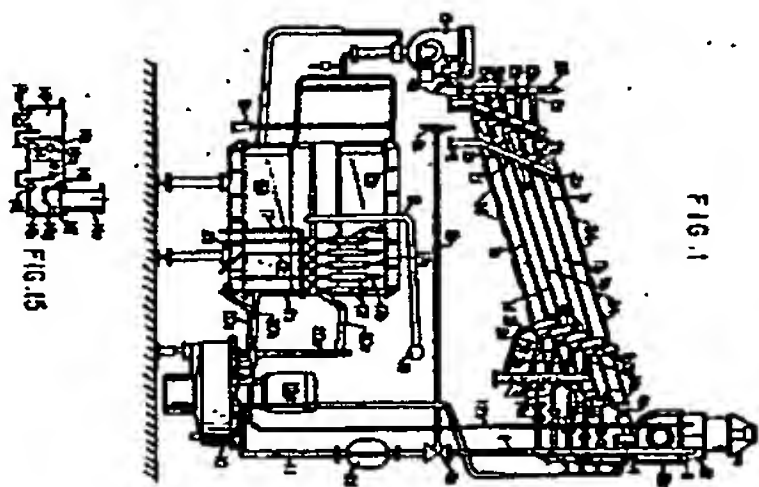


FIG. 15

117862 COMPLETE SPECIFICATION  
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Sheet 2

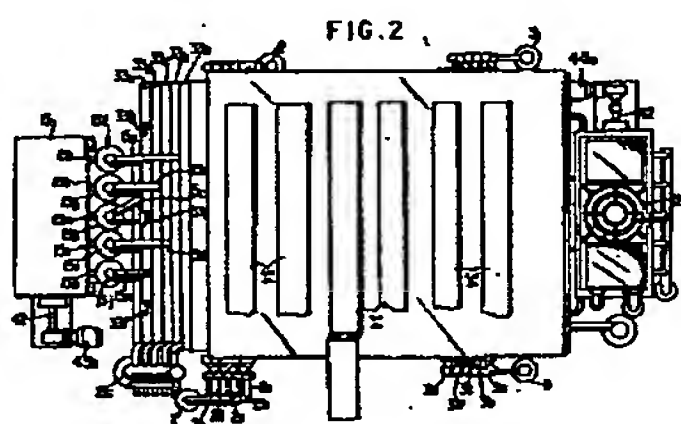


FIG. 2

117862 COMPLETE SPECIFICATION  
The Drawing is a representation of  
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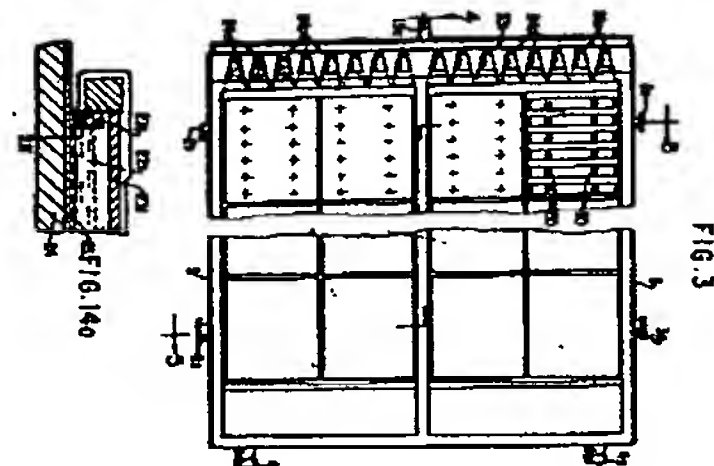


FIG. 3

FIG. 140

117862 COMPLETE SPECIFICATION  
The Drawing is a representation of  
7 SHEETS  
No. 10,000,000  
Sheet 4

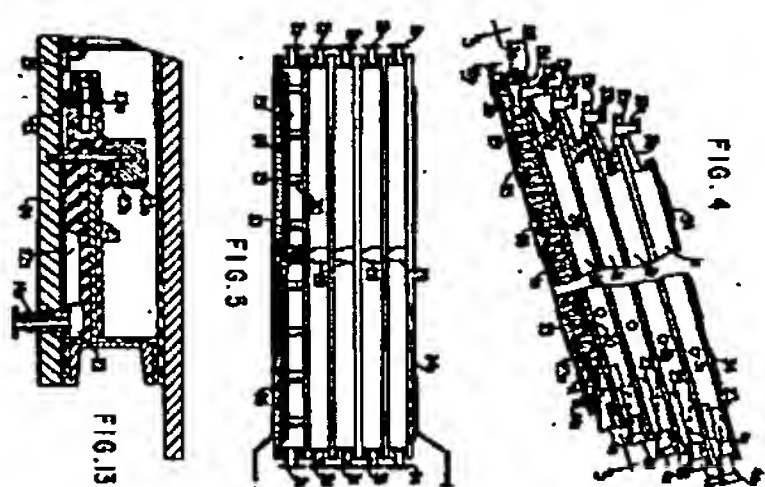


FIG. 4

FIG. 5

FIG. 13

117862 COMPLETE SPECIFICATION  
The Drawing is a representation of  
7 SHEETS  
No. 10,000,000  
Sheet 5

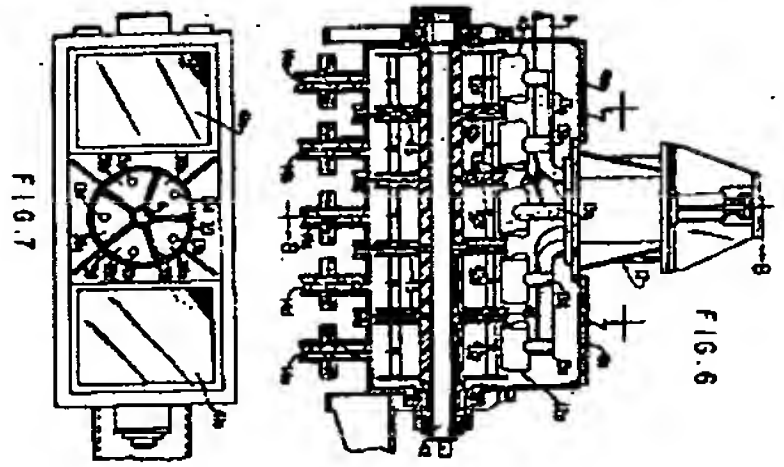


FIG. 6

FIG. 7

117862 COMPLETE SPECIFICATION  
The Drawing is a representation of  
7 SHEETS  
No. 10,000,000  
Sheet 6

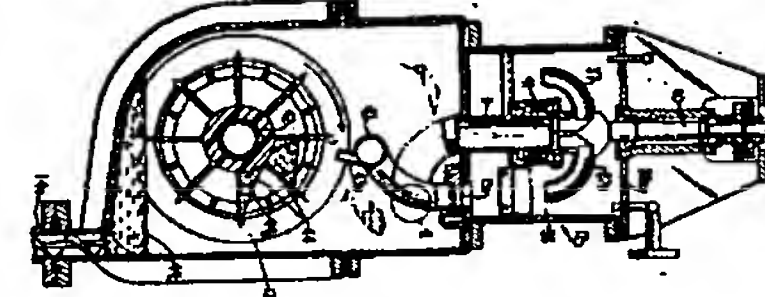


FIG. 8